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Root's Wrought-Iron Sectional Safety Boiler.

The inventor who devises methods to safe life, or the means whereby the ordinary risks of loss of life and property by accident is lessened or done away with, is truly a philanthropist in every sense of the word. There is no agent employed by man more destructive in its tendencies, perhaps, than steam. It is a servant of great value, when its gigantic power is kept within certain limits, but "eternal vigilance" is the price of safety when it is employed in the ordinary manner. Insurance rates are large, and growing larger against loss by boiler explosions, which is owing to the apparent growing feeling of insecurity of this kind of property This goes to prove a radical defect in the principle upon which the ordinary kinds of boilers are constructed

The accompanying engravings represents an apparatus which is believed to possess essential features for safety, thereby overcoming the liability to accident which ordinary boilers are more or less liable. The subdivision of the water and steam in small compartments of small diameter, is one of the essential features in this invention.

This construction is claimed to insure great strength, inasmuch as a tube four inches in diameter and of metal one-eighth of an inch in thickness is capable of resisting as great a pressure as a shell four feet in diameter and one and a half inches thick, and as in practice the tubes used are made of charcoal iron having a tensile strength of 45,000 pounds across the sheets of which they are made.

Fig. 1 is a perspective view of the boiler as erected for use, with a portion cut away to expose the inside. Fig. 2 is a perspective view of one of the square tube-heads employed in connecting the tubes, and shown in transverse section in Fig. 3. In Fig. 4 are shown two views, one a perspective and the other an inverted plane of one of the elbow-bends also employed in joining the ends of the tubes. Fig. 5 is a perspective view of one of the bolts and clamps. The heads of these bolts are locked into the square tube heads just mentioned, in order to hold the elbow-bends in their places. In the construction of this boiler the usual large sheet-iron shell is dispensed with, the greater part of the boiler consisting of the wrought-iron tubes, A, above which are situated the steam-drums, Z, which are connected with the upper tubes, as presently more fully explained, These steam-drums are made of very small diameters, say twelve and eighteen inches, and hence possess great strength.

The square heads, B, are screwed upon the ends of the tubes, A, and these heads form the front and rear

Fig. 1

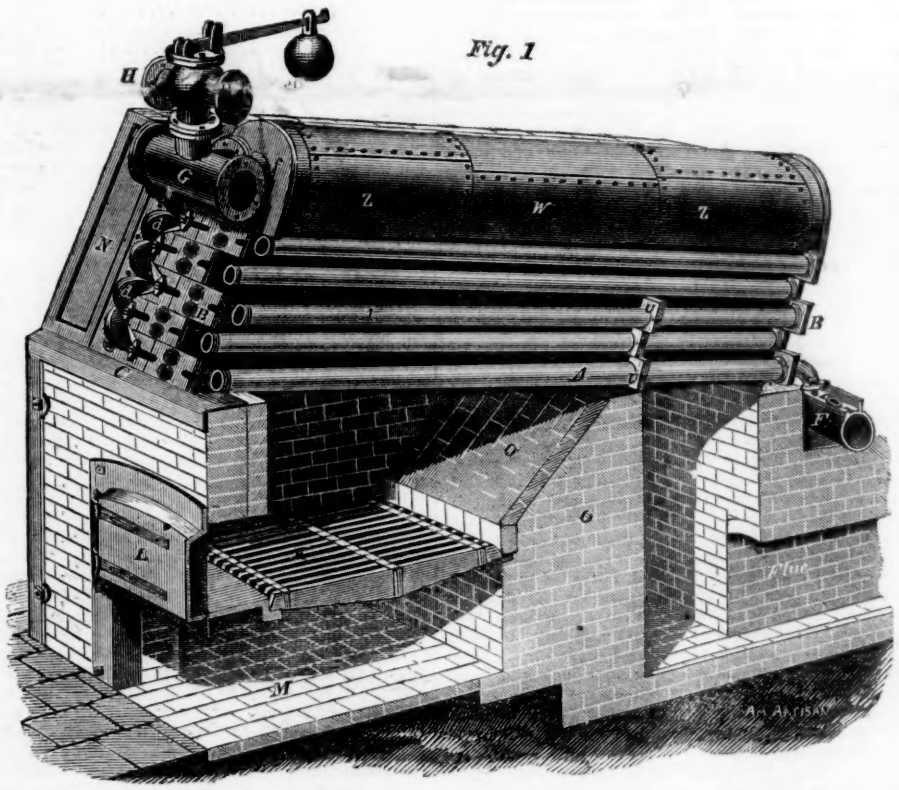
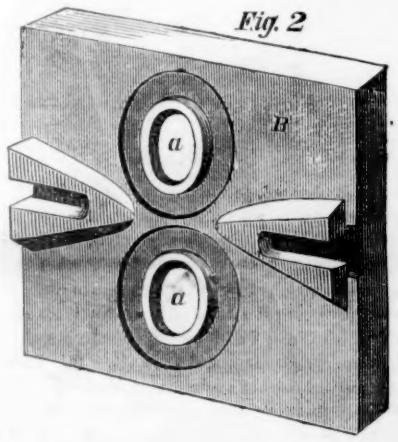
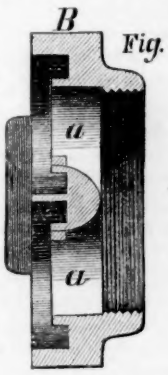


Fig. 2



they placed in vertical rows. The connection of the tubes, at each end of the boiler, is secured through the elbow-bends, D, covering the openings, A, in the heads, and connecting each tube with the one above and below it. These elbow-bends are seated at the ends upon vulcanized rubber gaskets resting in sockets in the heads, and are held in their places by the stud-bolts and clamps, E The lower horizontal row of tubes is connected in the same manner with the water cross pipe, F, into which the feed water is forced. The steam cross pipe, G, and steam-drum Z are also connected to the upper horizontal row of pipes by elbow bends. The steam is taken from the boiler in the usual manner, through the safety-valve, H. The grate bars of the furnace are shown at K, and the flames and heat pass upward between the tubes of the boiler over the bridge wall, O, iron bridge, U, and thence downward through the flue, or, in cases where it is desired, the draught may be taken out at the top and rear of the boiler. The boiler is supported front and rear by the bearing beams, C, which rest upon the masonry, which is held in position by suitable corner-stays, side stay bars, door frames, etc. In Fig. 1, the letters L and M represent respectively the fire-door and ash-pit of the furnace.

Fig. 3



It is claimed that with this boiler no dangerous explosion can occur, inasmuch as, although it may be overheated in parts, there is no strain thrown upon the

remainder, for each portion is free to expand independent of the rest, and even if one of the tubes should, from some unusual cause, be ruptured, it could not result in serious damage, for the reason that each of the tubes contains but a small quantity of water and steam, but, on the other hand, would simply relieve the boiler from the undue pressure.

This boiler is believed to combine in the highest degree the advantages of sectional boilers over those in which the entire contents of steam and water are in one body, and in the event of explosion, liable to be instantly discharged, to the destruction of all around. A strong circulation within the tubes is secured, whereby any deposit of sediment is prevented, unless allowed to accumulate by neglect. The inclination at which the tubes are set causes the sediment to descend into the water cross-pipe where the water is at rest, and from which it may be blown out on occasion.

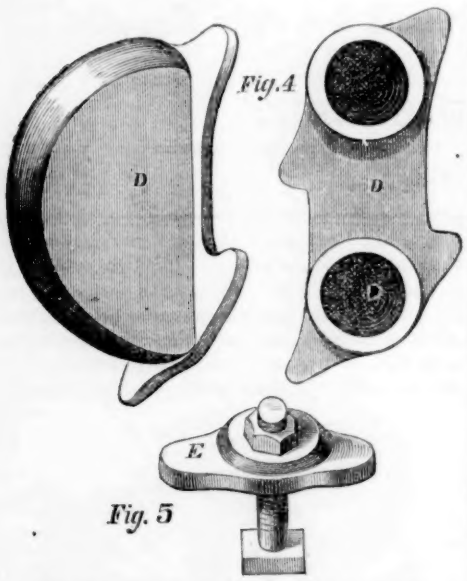


Fig. 4

Fig. 5

The manufacturer states that since this boiler has been put in market a large number have been sold, which are fulfilling the usual requirements of steam boilers with remarkable success, especially as regards economy of fuel, as their heating surface is of the most efficient kind, viz. tubes. The important advantages of the sectional form are claimed to be manifestly great, as, for instance, in convenience of transportation, erection in difficult locations, facility for examination and renewal, easy enlargement, uniformity of strength for all sizes up to the largest, rapidity of generation, etc. Persons wanting boilers may communicate with the manufacturer, who will supply illustrated descriptive pamphlets on application.

This boiler is manufactured by John B. Root, 95 and 97 Liberty street, N. Y.

LAMP BURNER.—It frequently occurs in so-called kerosene burners that the oil is drawn up the wick tube in excess of the quantity required to supply the flame, in which case the excess or surplus of oil runs down the exterior of the aforesaid tube, and besmears the burner and the lamp to which it is attached; and furthermore, that the condensation of vapors rising from the lamp, upon the internal surfaces of the burner, produces a like result. The object of this invention is to obviate these objections, and to this end it consists in openings formed in the top plate of the burner, and arranged in such relation with the wick-tube thereof, that the oil dripping down the latter, as just set forth, will be made to flow back into the body of the lamp. It also consists in the combination of a trough with the aforesaid openings, whereby the proper passage of the surplus oil to the latter is more effectually secured than would otherwise be the case. It further consists in constructing the burner with an external trough, whereby the products resulting from the condensation of vapors within the burner, may be prevented from dripping over the external surface of the body of the lamp. William Robinson, of Brooklyn, N. Y., is the patentee. —*American Artisan.*

On the Combustion of Hydrogen and Carbonic Oxide Under Great Pressure.

[By E. FRANKLAND, Ph. D., F.R.S., Professor of Chemistry in the Royal Institution, and in the Royal Society of Mines. Read before the Royal Society, June 11, 1868.]

In a former communication to the Royal Society, I described some researches on the effect of a diminution of pressure on some of the phenomena of combustion, and deduced therefrom the law that the diminution in illuminating power is directly proportional to the diminution in atmospheric pressure.

Further experiments, made more than a year ago, on the nature of the luminous agent in a coal gas flame, led me to doubt the correctness of the commonly received theory, first propounded by Sir Humphrey Davy, that the light of a gas flame, and of luminous flames in general, is due to the presence of solid particles. In reference to gas and candle-flames, it is now well known that the fuliginous matter produced when a piece of wire-gauze is depressed upon such flames, and the sooty deposit which coats a piece of porcelain placed in a similar position, are not pure carbon, but contain hydrogen, which is only completely got rid of by prolonged exposure to a white heat in an atmosphere of chlorine. On pursuing the subject further, I found that there are many flames possessing a high degree of luminosity which cannot possibly contain solid particles. Thus the flame of metallic arsenic burning in oxygen emits a remarkably intense white light; and as metallic arsenic volatilises at 180° C., and its product of combustion (arsenious anhydride) at 218° C., whilst the temperature of incandescence of solids is at least 500° C., it is obviously impossible here to assume the presence of ignited solid particles in the flame. Again, if carbonic desulphide vapor be made to burn in oxygen, or oxygen in carbonic desulphide vapor, an almost insupportably brilliant light is the result. Now, fuliginous matter is never present in any part of this flame, and the boiling point of sulphur (440° C.) is below the temperature of incandescence, so that the assumption of solid particles in the flame is here also inadmissible. If the last experiment be varied by the substitution of nitric oxide gas for oxygen, the result is still the same; and the dazzling light produced by the combustion of these compounds is also so rich in the more refrangible rays that it has been employed in taking instantaneous photographs, and for exhibiting the phenomena of fluorescence.

Many other similar cases of the production of brilliant light from incandescent, gaseous, or vaporous matter might be cited; but I will mention only one other. Among the chemical reactions celebrated for the production of dazzling light, there are few which surpass the active combustion of phosphorous in oxygen. Now phosphoric anhydride, the product of this combustion, is volatile at a red heat; and it is therefore manifestly impossible that this substance should exist in the solid form at the temperature of the phosphorous flame, which far transcends the melting point of platinum. For these reasons, and for others stated in the lectures above quoted, I consider that incandescent particles of carbon are not the source of light in gas and candle-flames, but that the luminosity of these flames is due to radiations from dense but transparent hydrocarbon vapors. As a further generalization from the experiment above mentioned, I was led to the conclusion that dense gases and vapors become luminous at much lower temperatures than aeriform fluids of comparatively low specific gravity, and that this result is to a great extent, if not altogether, independent of the nature of the gas or vapor, inasmuch as I found that gases of low density, which are not luminous at a given temperature when burnt under common atmospheric pressure, become so when they are simultaneously compressed. Thus mixtures of hydrogen and carbonic oxide, with oxygen, emit but little light when they are burnt or exploded in free air, but exhibit intense luminosity when exploded in closed glass vessels, so as to prevent their expansion at the moment of combustion.

I have recently extended these experiments to the combustion of jets of hydrogen and carbonic oxide in oxygen under a pressure gradually increasing to twenty atmospheres. These experiments were conducted in a strong iron vessel, furnished with a thick plate of glass of sufficient size to permit of the optical examination of the flame. The results are so remarkable that, although still far from being complete, I venture to communicate them to the Royal Society before the close of the session. The appearance of a jet of hydrogen burning in oxygen under the ordinary atmospheric pressure is too well known to need description. On increasing the pressure to two atmospheres, the previously feeble luminosity is very visibly augmented, whilst at ten atmospheres' pressure the light emitted by a jet about one inch long is amply sufficient to enable the observer to read a newspaper at a distance of two feet from the flame, and this without any reflecting surface behind the flame. Examined by the spetroscope, the spectrum of this flame is bright and perfectly continuous from red to violet.

With a higher initial luminosity, the flame of carbonic oxide in oxygen becomes much more luminous at a pressure of ten atmospheres than a flame of hydrogen of the same size and burning under the same pressure. The spectrum of carbonic oxide burning in air is well known to be continuous; burnt in oxygen under a pressure of fourteen atmospheres, the spectrum of the flame is very brilliant, and perfectly continuous.

If it be true that dense gases emit more light than rare ones when ignited, the passage of the electric spark through different gases ought to produce an amount of light varying with the density of the gas; and this is in fact the case. for electric sparks passed as nearly as possible under similar conditions through hydrogen, oxygen, chlorine and sulphurous anhydride emit light, the intensity of which is very slight in the case of hydrogen, considerable in that of oxygen, and very great in the case of chlorine and sulphurous anhydride. When liquefied sulphurous anhydride is sealed up in a strong tube furnished with platinum wires, and the temperature then allowed to rise until the internal pressure amounts to three or four atmospheres, the passage of induction-sparks through the enclosed gas is attended with very brilliant flashes of light. Further, if a stream of induction-sparks be passed through air confined in a glass tube connected with a condensing cyringe, and the pressure of the air be gradually augmented to two or three atmospheres, a very marked increase in the luminosity of the sparks is observed, whilst on allowing the condensed air to escape, the same phenomena are observed in the reverse order.

The electric arc from fifty cells of Grove's battery is incomparably more brilliant when mercury vapor, instead of atmospheric air, is interposed in the path of the discharge between the carbon points. The gases and vapors just mentioned have the following relative densities:

Hydrogen	1.0
Air	14.5
Oxygen	16.0
Sulphurous anhydride	32.0
Chlorine	35.5
Mercury	100.0

It is obvious that the above results have a very direct bearing upon the views now generally held regarding the constitution of the sun, stars, and nebulæ; but I refrain from making any such application of them until I have the honor of laying before the Royal Society a complete account of these experiments.

Chestnut Hill Reservoir, Boston.

The regular Boston correspondent of the San Francisco *Times*, writing of this great work says: "Few who have not traversed the circumference of this gigantic work have any adequate idea of the vastness of the undertaking It is one of those projects which, when consummated, will prove an enduring crown of honor to the city of Boston. The immensity of the reservoir may be imagined from the fact that it contains a water area of 125 acres, the whole extent of the receptacle being 132 acres. To excavate to the required depth such a tract of land, and surround it with a wall that will absolutely prevent the leakage of water, would have been a herculean labor in other days, but now it is simply a question of time and money. The reservoir is divided into two basins, the smaller of which is expected to be ready for use some time during the next fall. In the preparation of the larger basin some obstacles have to be overcome which prevent a very rapid progress in this part of the work. Quicksands have retarded the building of the wall in a certain locality, but the orders to find a solid foundation are in process of fulfilment, notwithstanding the deep cut required for that purpose. There will be an average depth of eighteen feet of water in the reservoir when it shall have been filled, and the enormous amount which this would give when spread over a surface of 125 acres will readily be acknowledged. Six hundred men are employed upon the reservoir, and with their horses and oxen make a long train. It has been the purpose of the Water Board having charge of this work, to so construct it that there shall be no flaws or deficiencies therein, to cause the sweeping away of the walls and the flooding of the adjacent land, as has been the case in some other New England cities. When the reservoir is done, with the incomparable driveway, no citizen of Boston can help taking pride at the energy, comprehensiveness, and liberality which began and completed such a grand public enterprise. The work was begun about one year ago, and it will take some considerable time longer to complete it. The Boston Water Works, when the immense basin is finished, will be in all respects superior to anything of the kind in the New World, and if history is to be credited, will take a front rank with those of the ancients."

On Some of the Constituents of Coal Gas

A Lecture by Dr. ODLING, F.R.S., F.C.S., etc., before the British Association of Gas Managers.

[From the Journal of Gas Lighting.]

(Continued from p. 5) of the American Gas-Light Journal.)

The next constituent of coal gas to which I wish to call your attention is ammonia. The proportion of ammonia in London gas is very small. We find that 1 grain of ammonia in 100 cubic feet of gas is sufficient to affect turmeric paper; upon which ordinary London gas is usually without or almost without action. Ammonia is a very interesting substance to gas manufacturers. Of all the common gases—*i. e.*, of all gases which are not chemical curiosities—it is the one most soluble in water. At mean temperature, 1 cubic inch of water will dissolve 783 cubic inches of ammonia. The dissolution of ammonia in water takes place with very great rapidity. I have here a sealed glass tube, filled with ammonia gas. On breaking the end of the tube under water colored with red litmus, you perceive that the contained ammonia is absorbed in an instant, and the tube immediately and completely filled with the water, now turned of a blue color by the action of the ammonia. This is a very striking experiment. It would seem at first sight to warrant the notion that, since 1 cubic inch of water will dissolve 783 cubic ins. of ammonia, and dissolve it at this extremely rapid rate, the removal of ammonia from coal gas must be a very easy problem. But such is far from being the fact. The tube with which I have been experimenting was completely full of ammonia, unmixed with any other gas; but the tube I now hold in my hand contains but 75 per cent. of ammonia gas mixed with 25 per cent. of air. And you will observe how very much more slowly the liquid will rise up in this case. It makes a very great difference in the dissolution of a gas whether we are dealing with the gas itself, pure and simple, or whether we have it diluted to a certain extent with air. I now break the point of the tube under water, and you see at what a slow scarcely noticeable rate the gas gradually dissolves, and the water consequently rises in the tube; so much so that the complete solution of the gas will scarcely be effected by the conclusion of my lecture. Here you see how great a difference it makes whether you are dealing with ammonia by itself, or whether you are dealing with what is substantially ammonia, but which contains in admixture some 25 per cent. of air or coal gas. But, after all, in reference to the dissolution of ammonia in water, the difference in the rate of solution between a gas consisting entirely of ammonia and one consisting of ammonia to the extent of 75 per cent. is nothing compared with the difference between the latter and a gas of which the ammonia amounts to a few per cent. only, such as that with which you have to deal.

I want to illustrate to you in another way the fact that the solubility in water of a gas by itself, and of the same gas when mixed with other gases, is a very different thing. In illustration of this, I would call your attention to the difficulty there is in dissolving up from the air substances which by themselves are exceedingly soluble. This is an empty 4 lb. bottle, and into it I am going to put a few drops of strong ammonia. Having done this I now introduce a glass rod moistened with a little muriatic acid, and by this means I shall produce an abundance of white fumes of sal ammoniac inside the bottle. the bottle soon gets full of them. Now, sal ammoniac is a very soluble substance indeed; but you will observe the difficulty which I have in dissolving up these fumes of sal ammoniac from the air in the bottle. I half fill the bottle with water, whereby, as you see, a good deal of the fume is blown out; nevertheless, though I shake the bottle about, the remainder does not disappear. You see what a difficulty there is in dissolving, not sal ammoniac itself, but sal ammoniac when forming say 1 per cent. or a half per cent. of air. Indeed, I have to shake up the bottle very violently and for some time with this large excess of water, in order to get rid of the fume altogether. This shows that the mere passage of any gas over a considerable extent of water surface will not be sufficient to cause its soluble impurities to be taken up, but that long contact or considerable agitation with the water is required.

I will now give you another illustration of the same difficulty. I have here a bottle containing strong ammonia, and here another containing sulphuric acid.—The sulphuric acid is very much stronger than that with which gas managers are in the habit of washing their gas. It is of about the strength of ordinary brown acid; nevertheless you will see that on blowing through the first bottle I shall get a current of air charged with ammoniacal vapor, and that, on its passage through this comparatively strong sulphuric acid, the whole of the ammonia will not be removed. You perceive that the gas which has bubbled up through the sulphuric acid has, notwithstanding, the property of browning turmeric paper; and on passing it for a few minutes through red infusion of cabbage, the red color of the liquid is turned successively purple, blue, and finally green. The strong acid, employed in this way, is quite powerless to remove from the air the ammonia which it has taken up by its passage through the solution of ammonia. This shows how very difficult it is sometimes to remove small proportions of ammonia, not only by a substance like water, in which it simply dissolves, but even by sulphuric acid, with which it enters into chemical combination. And this is true, not only of ammonia, but of all other impurities of coal gas; when they are reduced to small quantities it is most difficult to get rid of them entirely. The nearly pure gas requires to come into most intimate contact with the several absorbant substances employed for a considerable length of time in order to become entirely freed from impurity.

With regard to ammonia, I will show you one other experiment. Though, as I have said, this gas is so soluble that one volume of water will dissolve 783 volumes of ammonia, nevertheless it is very readily removable from water by the agency of air, or coal gas, or, indeed, any gaseous substance whatever. Accordingly you will find that even the weakest solution of ammonia will give off some of its ammonia upon agitation with a considerable volume of air. I will take two 4 lb. bottles, and half fill each of them with water. Into each of these bottles I will now suspend a piece of ordinary red litmus paper, just damped slightly. The one bottle contains pure water, and I do not expect to find the paper in it affected at all; but to the 2 lbs. of water in the other bottle I will add three drops only of solution of ammonia—*i. e.*, of ammonia gas already dissolved in about two drops of water—and yet this 2 lbs. of water will not be able to retain all the ammonia and prevent its diffusing into the air. Upon shaking up the bottle, the ammonia diffuses itself out of the water into the air above it, and in a few minutes you will see that the litmus paper (which I now suspend in the air of the bottle) has become completely blue, through the minute proportion of ammonia in the water having partially escaped into the air above it.

I will now direct your attention to the mode in which ammonia combines with acids to form salts. Of all metallic salts chloride of sodium, or common salt, is the most familiar, and may conveniently be taken as the type. It consists of one proportion of sodium, having the relative weight 23, combined with one proportion of chlorine, having the relative weight 35. Writing each of these proportions by the symbols Na (natrium) and Cl respectively, common salt is expressed by the symbol NaCl. Now, it will be observed that common salt, or chloride of sodium differs from muriatic acid, or chloride of hydrogen, HCl, in the circumstance of its containing a proportion of sodium having the relative weight 23 instead of a proportion of hydrogen having the relative weight 1; and in a similar manner it will be found that metallic salts in general are formed from acids by the substitution of metal for the hydrogen of the acid. Thus, when muriatic acid is neutralized with caustic soda, NaHO, common salt is produced by the following reaction:

$$NCl + NaHO = NaCl + HHO.$$

We begin with chloride of hydrogen, and end with chloride of sodium.

But the formation and constitution of ammonia salts are very different. In order to make sal ammoniac, or chloride of ammonium, I do not replace the hydrogen of the acid by any metallic substance whatever, but I combine the entire acid, hydrogen and all, with ammonia, thus:

$$HCl + NH_3 = NH_3HCl.$$

And similarly with regard to the sulphate, nitrate, oxalate, and other salts of ammonia, they are all of them constituted of the original hydrogen acid, or hydrated acid, combined directly with ammonia.

But salts of ammonia present a very remarkable resemblance in many of their properties to ordinary metallic salts, more particularly to salts of potassium, and in a less degree to salts of sodium. Here, some chemists are disposed to regard ammonia salts as really containing a metal—not a simple metal like sodium, but a compound metal formed by the union of the ammonia with the hydrogen of the acid. Accordingly they represent sal ammoniac not by the formula NH_3HCl, but, instead, by the formula $(NH_4)Cl$; and they call it not muriate or hydrochlorate of ammonia, but, instead, chloride of ammonium. Now, there is one very striking property of ammoniacal salts which, so far as it goes, is strongly in favor of this view—which really seems to show that ammonia can unite with the hydrogen of muriatic acid to form a compound metal.

The evidence is of this kind: Mercury, which is the only metal existing in the liquid state at ordinary temperatures, is capable of uniting with many other metals, but with no other bodies than metals, to form semi-liquid or pasty alloys, which are called amalgams. Gold and silver, indeed, as usually extracted from their respective ores by the process of amalgamation. The precious metals are first dissolved in mercury; the excess of mercury is then strained or squeezed off, and the soft or pasty amalgam submitted to distillation. Now, when chloride of sodium is decomposed by the galvanic battery, chlorine is liberated at one pole and metallic sodium at the other, and if this other pole be formed of a drop of mercury, the sodium, as it is set free, is taken up by the drop of mercury to form sodium amalgam. Similarly, when chloride of ammonium is decomposed by the galvanic battery, chlorine is liberated at the one pole, while there is formed at the other, in presence of a drop of mercury, an abundant amalgam, which consists of nothing but mercury, ammonia, and hydrogen. Now, since amalgams are formed only by the union of mercury with metals, the production of an ammonium amalgam is some evidence that its constituents, ammonia and hydrogen, are contained in the form of a compound metal.

I am able to produce this ammonium amalgam in another form, and to show it you on a somewhat large scale. I have here some sodium amalgam already prepared by dissolving metallic sodium in heated mercury, and if I now pour this amalgam into a solution of chloride of ammonium, the chlorine leaves the latter salt to unite with the sodium of the amalgam and form chloride of sodium, while the ammonium takes the place of the sodium and unites with the mercury to form ammonium amalgam. You see directly I pour in the liquid amalgam of sodium, the bulky pasty amalgam of ammonium is at once formed, which, expanding to some hundred times its original bulk from the evolution of interstitial hydrogen, speedily overflows the vessel. Accordingly, ammonia salts may be regarded either as direct combinations of ammonia (NH_3) with the hydrated acids, such as hydrochloric acid (HCl), sulphuric acid (H_2SO_4), etc; or as derivatives of the several acids through a replacement of their hydrogen by the compound metal ammonium (NH_4). Which of these views is most correct must be regarded as an open question. Some facts are in favor of the one view, and some the other. Most chemists are now in the habit of employing both modes of representation alternatively in different cases.

Ammonia is a very interesting body in another relation altogether. It is of all inflammable bodies the one which approaches nearest to being inflammable. Here we have, in this flask, some solution of ammonia which, upon being gently heated, furnishes us with an abundant supply of ammonia gas. On applying a light, the gas burns, as you see, with a pale green flame, but on taking away the light it ceases to burn. The heat produced by its own combustion is not sufficient to maintain it in combustion, and it only burns in contact with the flame of some other body. But though it will not burn in air it will burn in oxygen gas, and I will now give you an illustration of the combustibility of ammonia in oxygen gas. On surrounding the jet of ammonia by a current of oxygen you observe that it burns I might say brilliantly, with its characteristic greenish yellow flame.

Why does ammonia burn so freely in oxygen gas and so difficultly in air? There are several reasons, the principal one being that when the ammonia burns in air, for every one volume of oxygen which takes part in the action, and which has to be heated up to the temperature of the flame, there are four parts of nitrogen which have also to be heated up to the same temperature, but which contribute nothing to the action or the temperature. Moreover, when burning in oxygen, the jet of ammonia is at any given instant in contact with five times as much oxygen as when burning in air. I can give you another illustration of the combustibility of ammonia gas in a somewhat different form. I take a Florence flask, and into it I pour a little strong solution of ammonia. I now place over the strong ammonia a coil of platinum wire, which is first heated just to redness. You perceive that the platinum wire exposed to the ammonia continues to glow for a considerable time; and if I now pass into the gas a rapid stream of oxygen, ignition of the wire becomes more intense by reason of the chemical combination taking place between the ammonia and oxygen, and in a minute or two it becomes so hot as to inflame and explode the mixture of gases.

The fumes remaining in the flask are an evidence of the oxidation which has taken place, not only of the hydrogen of the ammonia into water, but of its nitrogen into nitrous or nitric acid. This is an important fact with regard to the combustion of ammonia, for we shall find, when speaking of sulphur in gas, that this sulphur is oxidized by burning into sulphurous acid only, which, when sufficiently diluted, is a very innocent substance; whereas if considerable portions of ammonia are present in the burning gas, the ammonia in burning yields different oxides of nitrogen, which effect a partial conversion of the sulphurous acid into sulphuric acid. In burning ammonia, then, we find that the hydrogen of the ammonia unites with oxygen to form water, whereas the nitrogen of the ammonia is partially liberated in a free state as nitrogen gas, and partly transformed into nitrous acid. Accordingly, we always get by the combustion of ammonia a certain amount of nitrous acid, which acts as a powerful oxidizing agent. In ordinary purified gas, however, the proportion of ammonia is so exceedingly minute—in most cases insufficient to affect turmeric paper at all—

that this point respecting the products of combustion is not of any practical interest. There is one other mode of burning ammonia to which I will direct your attention for an instant, which has a more practical bearing. Although ammonia will not burn in air by itself, it will burn in air if mixed with some other inflammable gas. I am here burning some hydrogen gas, and now, instead of burning it directly, I will first pass it through strong ammonia, when you perceive that the size of the flame is very much increased, and its appearance entirely altered from the cunsiderable combustion of the ammonia which the hydrogen has taken up. You see, therefore, that in removing the ammonia from your gas you do really remove a combustible, and even to some extent a luminiferous constituent of the gas.

(To be continued.)

The New York Society of Practical Engineering.

[Reported for the AMERICAN GAS-LIGHT JOURNAL.]

This society held its regular fortnightly meeting at its room, No. 24 Cooper Union, on Tuesday evening, August 18th; the President, James A. Whitney, in the chair, Wm. B. Harrison, Recording Secretary.

The proceedings of the meeting were inaugurated by Mr. Whitney, who read an extended paper on "Water Meters and their uses." We make an abstract of the paper as follows:

No question of practical engineering, either in ancient or modern times, has exhibited greater attention than the water supply of towns and cities. The proofs and illustrations of this may be found in the great water-works, the ruins of which are yet seen by travelers in Jerusalem, and which were built in the time of Solomon, and in the aqueducts which supplied the city of Rome, also in the aqueducts the remains of which are yet extant in Central America. This matter of water supply has received the same attention in modern times, as may be seen by the great Lisbon aqueduct, built about a hundred and thirty years ago and carried over a deep valley on arches of masonry, in one case two hundred and fifty feet in height; and by the Croton aqueduct of New York City, which is forty four miles long.

The subject of water supply at the present time assumes new conditions from the necessity of governing the distribution of the water as well as supplying it in the first instance. In the city of New York the waste of water is enormous, the quantity furnished per inhabitant being about three times as much as in London or in Philadelphia. The amount supplied in the city of New York is sixty-two million gallons daily to a population of about half a million; in other words, about one hundred and twenty four gallons to each person, while in London, according to statistics of various water companies, the supply to each person is thirty-three gallons; or a little more than a barrel per diem. The London companies do not furnish the water continuously, as is done in American cities, but intermittently, or only at certain hours of the day, the water being drawn at such periods, and stored in pails, casks, etc., for use. The English companies would be glad to adopt the plan of continuous supply, but are afraid of the great increase of expense resulting from greater waste. Even the intermittent-supply system, with all its inconveniences, does not prevent considerable loss from this cause. In the city of Glasgo v, where the same is in use, the daily waste of water is estimated at seven million gallons.

With regard to the waste in New York, the late chief engineer of the Croton Department has stated that "the want of head is as a general thing felt throughout the whole city;" that "the citizens indulge in profligate waste; that while in 1867 the average supply of water per deim to each inhabitant in Philadelphia was three hundred and twenty gallons, during the same year in New York City it approximated nine hundred and sixty-four gallons. There would appear to be no means of effectually checking this wanton loss other than putting a meter on the water supply pipe of each building.

The opposition shown to the introduction of meters on the ground that economy would induce the poor to avoid the use of a sufficient quantity for health and comfort will not hold good. This objection could be readily met by allowing a certain amount of water free of any charge other than the water rent, the charge being only for the surplus, or, in other words, for the amount now wasted. This would not stint the poor, and would secure the desired saving of nearly two-thirds of the water now supplied, and in proportion to such saving would permit the reduction of the water rents *minus* the annual charge for the meters. The people of New York will, in fact, soon have to choose between a costly enlargement of the aqueduct, etc., or adopt some means by which the carelessness of some in the waste of water shall not be allowed to inflict want on others.

Some sixty or seventy water meters have been patented in this country within fifteen or eighteen years past. What are called low pressure me ers simply measure the water into reservoirs, and are not adapted to American wants, although they have been used somewhat in England. The other kinds of meters which are operated by the pressure of the water, and which measure the water as it passes through them, may be divided into three classes, thus mentioned in brief as "reaction meters," which comprises all those constructed on the principle of the screw, the turbine, or the Barker Mill. The rotary piston meter, characterized by the employment of pistons shaped like buckets, paddles, etc., and rotating in one direction, and "reciprocating piston meters," in which the pistons have a movement in opposite directions, and in which may be included the diaphragm meters, the diaphragm being merely the substitute or equivalent for a piston."

One of the most prominent examples of the reaction meters is the Siemans and Adamson meter which, as commonly made, somewhat resembles a Barker Mill, but the inventors have also patented the screw and turbine form. The great objection to this variety of meters is that they require very careful and delicate adjustment of their parts, and if their motion is stopped or impeded, the water may flow through without being properly registered as to quantity.

The rotary meters are better than those made on the reaction principle in these respects, but as they resemble rotary engines in their plan of operation they are subject to similar defects, and do not appear to meet with much favor. The piston meters, on the other hand, appear to promise more success. There are many of these, some of them nearly or quite good for nothing, and some having a high degree of efficiency. Among the latter may be named the Worthington Meter, Jopling's English Meter, the Hicks Meter, and one termed by its inventer the Balanced Meter.

As a number of meters, among which are two of those above mentioned, have been brought forward since the last trial by the Croton Board, there should be another test in order that the merit of recent improvements may be put in the way of recognition.

An interesting discussion followed the reading of Mr. Whitney's paper.

Dr. A. W. Hall said that it appeared to him that a good water meter could be made on a plan similar to that of the common gas meter, if the water or liquid medium in the latter was replaced by mercury, which is many times heavier than water, provided the quicksilver communicated no deleterious quality to the water. To this the president remarked that the only injury that could result to the water in passing through the quicksilver would arise from the mechanical taking up of the particles, for nothing like a chemical combination could take place in such a case.

Mr. Lawrence Holms made a drawing on the blackboard, of the Siemen's Meter, and explained the same in detail. This meter, as thus described, consists in two screws or turbines, working on horizontal shafts, the journals of which are delicately adjusted on steel or agate bearings. The impact of the current of water on the spiral surfaces of the screws causes them to turn, and their movement acting through a system of wheel-work operates the registering device. Mr. H. stated that some years ago these meters were on sale in England at a moderate price.

Mr. Mason illustrated by drawings upon the blackboard a meter of his own. This relates to the piston class, and has a single piston which communicates motion alternately to two slide valves. He also described several devices of different construction; one of these was noticeable on account of the peculiar nature of its piston packing. This packing consists of a ring of india-rubber, cylindrical in its cross section, and rolling upon the surface of the piston as the latter reciprocates.

In the discussion, which was quite lengthy, it was stated that the springs or weights generally employed in single piston meters to insure the proper operation of the valves, involved a loss of power. This was disputed, it being claimed that what is lost at one part of the stroke of the piston is made up at another.

Previous to adjournment a resolution was unanimously passed, authorizing the president to appoint a committee of five to examine such plans of meters as might be laid before them. Messrs. Joseph B. Lyman, William B. Harrison, Lawrence Holms, J. T. Kirk, and Dr. A. P. Preterre, were appointed such committee.

The next meeting of the society will be held at the same place on the evening of Tuesday, September 1st, when the subject for consideration will be "The Cleansing and Disinfecting of City Streets."

BENEFITS OF ADVERTISING.—Advertising has created many a new business; has enlarged many an old business; has revived many a dull business; has rescued many a lost business; has saved many a failing business; has preserved many a large business; and insures success in any business.

New York City Sewerage.

REPORT OF GEN. VIELE ON THE NECESSITY FOR A RADICAL IMPROVEMENT OF OUR SYSTEM OF SEWERAGE, ETC.

"Salus populi suprema lex."

The recent reports of the Registrar of Vital Statistics with reference to the public health contain many statements of deep interest to all classes of citizens; but the most important are the facts elicited which demonstrate the direct causes of the increased rate of mortality prominent among which, in every locality, appear the two great facts that there is too much water underneath the surface and too little for use above. The last report states: "In the First ward, with the foulest tenements, sewers and gutters in the city, there was one death to every eight hundred inhabitants. * * * In the First ward, with a low death rate until the last three weeks, there was one death to every six hundred and fifty of the inhabitants. Pools of filth along the entire western side of this ward, garbage in every gutter and stagnant sewerage are ample causes. The Eighth ward has similar causes at war with health." These statements are confirmed by a recent report of the Board having the sewerage of the city in charge, which says: "There are already more than two hundred miles of sewers under our streets, nearly all of which have been built without regard to system. To correct or even lessen the evils arising from so many years of mismanagement is a task requiring much study, care and time." It may therefore be assumed that to defective drainage and sewerage and to an insufficient water supply may be attributed most of the sanitary evils from which the city of New York suffers at this moment. To examine this matter still more closely we find that of the twelve thousand acres comprising the superficial area of the city, representing one hundred and fifty thousand building lots, one-fifth of that amount or thirty thousand building lots, are, by reason of the presence in greater or less quantities of water in the soil, rendered almost unfit to be occupied as sites for dwellings or for commercial purposes. Yet no attempt of any kind has ever been made to establish a system of drainage by which these thirty thousand lots, averaging in value $10,000, or possessing a total value even in their present condition of $300,000,000, can be made suitable places for residences or warehouses. The sewerage system, imperfect in itself, has no effect whatever upon the drainage. There are many localities where coffer dams and pumps are absolutely necessary to enable the builders to secure a proper foundation for the structures about to be erected. Yet what must be the normal condition of those buildings after they are constructed, and what must be the condition of the entire neighborhood where this constant presence of water in the soil, and a consequent humid miasmatic condition of the atmosphere, is always ready to combine with those impurities which invariably attend the crowded occupation of any locality?

It would be more than useless to dilate upon this subject were not the remedy for the evils referred to so clearly within our reach, and it is for the purpose of pointing out those remedies that reference is now made to them.

In a previous report upon the topography and hydrology of New York the particular localities were pointed out where the accumulation of moisture in the soil, from springs and other sources, is productive of injurious effects. Upon the map accompanying that report the various lines of sewers, together with the elevations indicating the established grades of the streets, are represented, showing that from the anti-clinal axis of the island the sewerage descends to the North and East rivers, being conveyed directly into those rivers, polluting the waters, tainting the air, creating deposits of solid matter at the wharves and piers, and in every way a fruitful source of the very evils which their construction was intended to remedy, not the least of which is the foul air, which at low tide and in certain directions of the wind is forced into the dwellings, and more especially felt in the chambers of the sick.

THE REMEDY.

The remedy for all this would be found in the construction along the exterior of the city of "low lying sewers," which would receive the contents of the lateral sewers, conveying them to points where they could be discharged at ebb tide or transferred to properly constructed vessels and transported as valuable fertilizing material to lands now lying waste in close proximity to the city. Thus one great and positive good would be accomplished, the benefit of which to the commercial interests alone would be immense, while as a sanitary measure, and more particularly as a means of thorough drainage, the results will be incalculable. These sewers lying below the lowest substratum of

water deposits would effectually remove all traces of moisture from those sections which have been for so many years the pestilential spots of the city. If the method of construction adopted should be that of coffer dams, by being made permanent in their character, would serve to intercept completely the tidal water which now permeates the made land along both rivers and thus secure the great desideratum of dry and deep cellars for the water front warehouses. The outer lines of the exterior streets being formed by this construction, the additional width so much required for these streets would be secured. It is not too much to say that the successful construction of these works will add one-third in value to the property directly benefitted by thorough drainage, amounting at a low estimate to the sum of $100,000,000, to say nothing of the indirect results obtained in the general sanitary improvement and material developments arising therefrom. In presenting this plan no claim is made to originality, since it is a fact already accomplished in the city of London.

For a long period of time, and even after the radical defects of London sewerage were removed by the organization of a Board of Public Works, the polluted water of the Thames, into which the sewerage system debouched, sent the most sickening odors over the metropolis, constantly threatening the return of the much dreaded plague, and rendering a residence in that city a most undesirable fate. Yet this disgusting and alarming condition of things, which was endured so long, might have been still further prolonged had it not been for the fact that the houses of Parliament were located on the Thames, and the purification of its waters thus become a necessity to the legislation of the British empire. Strong as was that necessity, ours is still stronger, since we have a two-fold object to be attained; and, although through a want of public spirit or temporizing policy the construction of these works may be delayed, there can be no question that it is the only remedy for a great evil which has been borne already too long.

THE WATER SUPPLY.

It may not be flattering to the conceit of a New Yorker to say that the Croton aqueduct, with its enormous cost, its great reservoirs for accumulation and distribution, its finished construction and massive masonry, by all of which a river has been checked in its course and distributed to rich and poor alike through all the ramifications of a great city, has failed to meet the object of its construction. Yet it is nevertheless true that there is but a limited supply of water, and that in most dwellings it is difficult to get water in the upper stories, and very many of them never have it there at all. For all sanitary purposes it is very defective. There is absolutely not water enough, and what there is has not sufficient head to supply the wants of the city—neither the luxuries of the rich nor the necessities of the poor. It cannot even be relied on as a guarantee against a general conflagration. The fault lies in the principle of its first construction. It is indeed an admirable copy of the splendid aqueducts of ancient Rome, which supplied that city with water in the days of the Cæsars. Yet that was before the age of steam; and although by the application of the simple principle of gravity water was accumulated and distributed throughout the imperial city, something more is required in our case than this. To get the water we require it should be elevated by the force of steam to a sufficient height and in sufficient quantities to supply the necessary demand. Its use for manufacturing purposes should be curtailed until domestic and sanitary necessities are satisfied. On Reservoir square, at present laid out as a pleasure ground, there should be constructed an elevated reservoir, into which, by the use of steam, water can be readily conveyed from the present reservoir, and thus acquire the necessary head which is essential to carry it to the upper stories of the houses. If more water is required than can be obtained from the Croton river, there are many other streams in Westchester county, much nearer the city, which with the aid of steam can be readily and quickly made available at a limited expense compared with the cost of the original works.

It is not simply in a hypercritical sense that I have endeavored to point out these evils and their remedy. The subject is one of the deepest importance involving the future prosperity and welfare of this metropolis, whote rapid increase in population and material wealth is a source of wonder and admiration. In its commercial activity—the exponent of American civilization—it bids fair to rival in civic beauty the other capitals of Europe. Yet, although so well adapted by nature for all the purposes of a commercial entrepôt, we have thus far failed to second the efforts of nature, but on the contrary have impeded them. Our beautiful Park and sculptured palaces of trade and industry seem like the ribbons and gewgaws with which depraved humanity seeks to hide the corruption that rankles beneath. We are neglecting the essential elements of permanent prosperity. Imperial Rome in the climax of her power owed to the *cloacæ* her municipal greatness; and Paris without her wonderful and perfect system of public works, instead of being the gay and splendid capital of modern Europe would be a spot to be avoided. To her system of subterranean drainage and sewerage she owes much of her prominence. What the cities of Europe have done in public improvements they learned the necessity of by bitter experience. Surely their example should suffice without waiting for fatal experience of our own to urge us to the adoption of measures so vitally important to all classes of society, and so necessary to the present health and future prosperity of the city.

EGBERT L. VIELE.

General Summary.

INTRODUCTION OF GAS INTO RAILROAD CARS.—The N. Y. and New Haven Railroad are trying a new experiment in the introduction and use of gas in their cars. A former experiment was tried on the same road a few years ago; but the inventor in that case relied upon atmospheric pressure to force the gas from the gasometer (under the cars) to the burners, and the plan proved a great failure. In the present instance the gas is forced out of the gasometer to the burner by means of strong springs, and the quantity of light can be regulated as desired. The new apparatus has as yet only been applied to one car of the 8 o'clock, P. M., Boston Express Line, with very satisfactory results, and will, in all probability, be introduced in all the cars of the night-lines at an early day.

THE PHILADELPHIA WATER WORKS.—The following statement shows the operation of the Philadelphia Water Works for the month of July:

Works.	No. of gallons pumped during the month.	Average No. of gallons pumped per day.
Fairmount....	748,059,045	24,130,937
Schuylkill....	270,293,562	8,719,147
Delaware.....	112,379,310	3,625,169
24th Ward...	75,557,520	2,438,339
Germantown..	19,146,600	660,223
	1,225,436,037	

A NEW FRENCH GAS LAMP.—The French, who were always strong in lamps, have lately brought out a new invention, which is said to be as brilliant as the oxy-hydrogen or lime lights, while it has the recommendation of being much less costly. Coal gas, intimately mixed with air, is urged with gentle pressure along a tube, and made to pass through a metallic plate pierced full of minute holes. By this means a vast number of jets are obtained, which, after being driven through a fine tissue of platinum wire, are lighted in the ordinary way. The platinum soon acquires a white heat, and gives out so brilliant a light that it cannot be supported by the naked eye. About one metre of gas is consumed per hour.

DISCOVERY OF PETROLEUM IN IRELAND.—We take the following from the London *Mining Journal*: "The industrial and commercial progress of the sister island has ever been much impeded through the comparative absence of fuel adapted for the generation of steam, for although peat exists in abundance, its bulkiness has precluded its use as a steam fuel, except in the immediate vicinity of the bogs. A discovery, however, is now reported, which, if proved to be of the vast importance at present attached to it, will bring about an important change in Irish industry. It appears that at Clones, in county Monaghan, a petroleum deposit has just been opened upon, offering indications quite as favorable as those which led to the development of the enormous oleaginous wealth of Pennsylvania. Sufficient time has not yet elapsed for the value of the spring to be ascertained, but the results of further researches are looked forward to with great interest."

WATER SUPPLY OF CARLISLE, ENG.—The *Builder* says the new water-works for Carlisle have just been completed. The reservoir had to be enlarged one-half, when it was found that the dimensions at first contemplated were insufficient, the embankments had to be extended and strengthened; rockwork required to be excavated, the existence of which had never been anticipated; and various other unforseen expenses are found necessary during the progress of the works; so that the contract has been exceeded to the extent of 2,000*l.* or 3,000*l.*, and altogether, instead of some 5,000*l.* or 6,000*l.*, a sum of 10,000*l.* has been added to the cost of the undertaking.

HARD RUBBER WAGONS.—The American Hard Rubber Vehicle Company have on exhibition at 27 Murray street, New York City, a whalebone rubber road wagon, which is the first instance of the application of vulcanized rubber to carriage making. The body of the wagon, including the seat and dash-board, is cast in one piece. The surface is highly polished, cannot be easily scratched or stained by mud, and its inventors claim that it is stronger, lighter, and fifty per cent. cheaper than those made of wood. Dr. J. S. Campbell and Mr. D. L. Budd, chemist, are the inventors and patentees.

Correspondence.

Correspondents in all cases should sign their communications with their names and address in full, not necessarily for publication, but as a guarantee of good faith.—EDS.

Taxes on Small Gas Works.

TIFFIN, OHIO, August 7th, 1868.

MESSRS. EDITORS: Through your columns I would call the attention of proprietors of small gas works to the necessity of combined action, in order to rid ourselves of the unjust discrimination made against gas, and which bears with such special weight on the small members of the family of gas works.

The President of a neighboring Gas Company wrote some time since to ask co-operation in this; feeling the object a good one I complied, and wrote to our Congressman, but I felt that the right course was to talk with each other through your (our) Journal, and organize to initiate measures for our relief from the unjust action of Congress in taking off the tax on petroleum, and leaving us to stagger under a burden much *increased* by this action. I think we can accomplish this in a manner that will give us but little trouble. My idea is to get up a suitable memorial to Congress, setting forth our greivances, and circulate it to each for signature through the mail, each one to the nearest gas works, and each two weeks report its whereabouts, and the signatures added in the interim. I ask the opinion of my brethren and yourselves if some such plan be feasible. Yours respectfully, MACHINIST.

Commendatory.

DETROIT, August 20th, 1868.

M. L. CALLENDER & Co.: I am glad to receive and note your timely remarks on Dr. (?) Harris on dry-lime purifying. I thank you for the article, and every practical man will do the same I am sure.

Yours truly, P. E. DEMILL.

Smedberg's "Synopsis of Gaslighting."

CLEVELAND, O., AUG. 13th, 1868.

MESSRS. EDITORS: Please place my name as a subscriber in your list for "Smedberg's Synopsis of British Gas-Lighting." I feel it would be of the utmost utility to every gas-engineer, superintendent or company. I would like to attend your Convention, and will endeavor to do it, if it is held in Cincinnati; but I could not possibly spare time if it was New York or Philadelphia. You will hear from me shortly relative to the success of our Works.

Yours respectfully. SAMUEL B. ALLEN,
Sup't Peoples' Gas Works, W. Cleveland, O.

The following subscriptions to the above work are asknowledged, making in all 192.

S. B. Allen, Sup't Peoples' Gas Co, W. Cleveland, Ohio.
Natchez Gas Light Co., Miss.

Fodell's System of Bookkeeping.

OFFICE NIAGARA FALLS GAS CO., Aug. 16th, 1868.

MESSRS. EDITORS: Seeing an advertisement in your last number of Mr. W. P. Fodell, who proposes to publish a work on book keeping for gas companies when a sufficient number of subscribers, etc., and that you receive subscriptions for the same; I would say that I would like to subscribe for a copy of the work, and you are hereby authorized to subscribe for me for one copy.

Yours truly, T. G. HULETT, Sup't.

The following subscriptions to "Fodell's System of Book-keeping for Gas-Light Companies" have been received, making in all 23:

Isaac Battin, Albany (N. Y.) Gas Light Company.
Washington Gas Light Company, Washington. D. C.
C. A. Gerdenier, Bridgeport, (Conn.) Gas Works.
W. G. Pugh, Office Baltimore (Md) Gas Company.
Harlem Gas Light Co., 76 Nassau street, N. Y.,
J. Beckley, Fon Du Lac (Wis.) Gas Works.
Mitchell, Allen & Co., Newbern, N. C.
W. H. McClelellan, Pittsburgh Gas Co.
J. Lawrence Smith, Louisville Gas Co.
John Walker, South Bend, Ind.
Harris & Co, Meter Makers, Phil.
J. H. Brown, Sup't Abbotsford Gas Co., Hastings Upon Hudson.
E. M. P, Buffalo, N. Y.
C. P. Hopkins, Sup't Racine Gas Works, Wis.

PATENT CLAIMS.

Pertaining to Gas, Water, etc.

81,063.—Gas Burner.—Walter J. Brassington, Brooklyn, N. Y.

I claim, 1. The valve A, placed inside of the ordinary gas burner, and operated so as to cut off the force of the gas to the desired quantity necessary to supply a miniature flame, substantially as described.

2. The valve-seat I H I, formed by the under side of the tip, in the ordinary gas burner, against which the valve A seats itself, for the purpose specified.

3. The application of the spiral spring B, in combination with the valve A, for the purpose herein specified.

4. The movable jacket M or casing, with the slot N, in combination with the band W, for the purpose of receiving the movable glass protector or hood R, substantially as described.

5. The combination of the internal movable valve A, with the elastic packing F, and plate G, and screw D, or their equivalents, substantially as shown and described, for the purposes set forth.

6. The application and use of the spring-point P, attached to the movable jacket M or casing, and the notch K, to receive the same, for the purpose of securing the aforesaid jacket M or casing in its proper position, when it is raised to protect the small flame U, or drawn down to permit a full flame at T, as herein specified.

7. A pull or handle O, or other suitable device attached to the movable jacket M or casing, for the purpose of operating the same, either up or down, substantially as described and herein set forth.

81,124.—Street Car Lantern.—Albert A. Young, Boston, Mass., assignor to himself and Francis McLaughlin, same place.

I claim, 1. The construction and arrangement of the lantern B, adjusted upon the roof of the car A, by suitable fastenings, whereby the light from a single lamp, reflected as described, will both light the car and indicate its destination, substantially in the manner and for the purpose described.

2. The construction and arrangement of the single light c inserted in the lantern B, at each end, substantially in the manner and for the purpose described.

3. The ventilators b b, as constructed and arranged, with wire netting, or its equivalent, upon the sides of the lantern B, substantially as described.

4. Lighting street-cars from the centre of the roof of the car, by means of a lamp or other light, hung in a lantern provided with reflecting surfaces, said lantern being raised above and fastened upon the roof of the car, substantially as described.

81,136.—Method of Generating Gas from Petroleum.—Car Carpenter, Buffalo, N. Y.

I claim, 1. The method herein described of generating illuminating gas from crude petroleum or other impure liquid hydrocarbons, consisting in, first, vaporizing the same by subjecting a body thereof to a low boiling-heat in a boiler, and then converting said vapor into a fixed gas, by subjecting it to a high heat in a separate retort, substantially as described.

2. In combination with the boiler A, constructed and operating as described, a condenser E, substantially as and for the purpose described.

3. In combination with the boiler A, constructed and operating as described, the steam or vapor-gauge a', substantially as and for the purpose specified.

81,198.—Apparatus for the Manufacture of Illuminating Gas.—F. W. Ofeldt and A. W. Almqvist, New York, N. Y., assignor to themselves and Thos Fitzsimmons, same place.

We claim, 1. The upright conical or spherical retort A, the reservoir B, and the cooler J, arranged substantially as described, for the purposes set forth.

2. The tube E, the valve rod F, and the float-valve H, in combination with the retort and reservoir, arranged and operating substantially as and for the purposes specified.

3. The method, herein shown and described, of uniting and securing together the retort and reservoir by the flanges C C and swing bolts d d, as set forth.

4. The method of oxygenating the gas, or the drums O and P revolving in the large drum or case M, constructed and operating substantially as shown and described.

5. The method of securing the gasometer to the head and bottom, by grooves and rings substantially as described.

6. The method of securing the gasometer against the force of the gas, by means of hoops C suspended by cords, as shown and described.

7. The safety-valve V, with its valve d, constructed and operating substantially as and for the purpose described, in combination with the gasometer T.

8. An arrangement of means of supplying air for oxygenating gas, by the expansive action of the gas, substantially as and for the purpose described.

81,242.—Apparatus for the Manufacture of Illuminating Gas.—P. H. Vander Weyde, M. D., New York, N. Y., assignor to Alfred Phillips and John MacDougall, same place.

I claim, 1. The rotating carbonizer, consisting in a revolving disk or disks, operating in connection with shaft or pulleys and chain, as herein described and for the purpose specified.

2. The detachable carbonizer h h, and d d d, with its compartments a, b, c, and e e, and valve v, as herein shown and described and for the purposes specified.

3. The gas-regulator k, with its buoyant-chambers m m, and interior valve, as herein shown and described, and for the purposes specified.

81,238.—Apparatus for Carburetting.—H. Woodward, London, England.

I claim, 1. The arrangement, in a cylindrical carburetting-vessel, a partition dividing said vessel into an upper and lower chambers, in combination with concentric perforated bridges or diaphragms in the upper chamber, as and for the purpose set forth.

2. In combination with the arrangement of chambers and concentric bridges, as claimed under the preceding clause, wicking passing over said bridges, through the partition and into the lower chamber, substantially as set forth.

3. The combination, with the bridges and dividing partition, of plates arranged tangentially or nearly so to said bridges, and forming with the wicking a packing-joint, as and for the purposes set forth.

4. In combination with the arrangement of chambers and concentric bridges, as claimed in the preceding clause, an air-inlet pipe, opening into the annular space formed by the casing and outermost bridge, and a gas-eduction pipe leading from the space between the dividing partition and the innermost bridge out of the carburetter, as and for the purposes set forth.

5. The carburetting vessel and float contained therein, in combination with the wicking or equivalent material, and curved bridges or diaphragms, upon which the same is spread and held, under the arrangement and for operation as, herein shown and specified.

6. The combination, with a carburetter, substantially as herein described, of an inlet-tube for the carburetting liquid, arranged to traverse both the upper and lower chambers, and terminating at or near the bottom of the latter, as shown and set forth.

The Phenomena of Light.

A number of experiments, illustrative of the phenomena of light, were performed recently by Professor Henry Morton, in the Philadelphia Academy of Music. The following, among others, were specially interesting.

"The professor placed himself and apparatus on a platform secured to one of the stage traps, and was then raised to a great height above the floor, at which elevation he burned in the compound blowpipe a piece of thick steel wire rope. The fountain of scintillating sparks and drops of melted steel—which, descending in a broad sheet some fifteen feet in width, poured upon the stage and rolled in a torrent of fiery hail toward the foot-lights—was a sight never to be forgotten A wheel five feet in diameter, supporting electrical tubes, was rotated, while flashes of electric fire from the largest induction coil in the world, belonging to the University of Pennsylvania, were passed through, producing a dazzling star of constantly changing colored rays.

"The drop-curtain, descending for a few moments, rose again, displaying a beautiful palace scene, illuminated by numerous lime-lights, judiciously placed. There then marched in a great number of masked figures, in costumes representing the colors of the rainbow, and bearing banners with brilliant devices. These taking positions, formed a tableau equal in brilliancy and beauty of general effect to anything we have ever seen upon the stage. At a signal the white light was extinguished and its place supplied by a pure yellow light, equally bright, when every trace of color disappeared, and the entire phalanx became a ghastly company of spectres bearing banners of white and black. The means for producing this yellow light is a device of Professor Morton's, entirely new and eminently efficient—in fact the entire house was illuminated with it from the stage, so that the same wonderful change was manifested in the faces and costumes of the audience."

Oxyhydrogen Light.

The *Journal of Society of Arts* says that the experiments commenced last year on the Place de l'Hotel de Ville, in Paris, on the oxyhydrogen light, are about to be continued by order of the Emperor, in the court of the Tuilleries. The magnesia cylinders having been found to corrode and waste away too rapidly for the purpose of a continuous light, an artillery officer, M. Caron, after experimenting with a variety of substances, has adopted zircon, a substance which Berzelius pointed out as infusible, and giving forth a very brilliant light under the blowpipe. It is said that M. Caron has had a cylinder of this substance in use with the oxyhydrogen light for a month without the slightest trace of volatilization. The luminous power of zircon, under the oxyhydrogen jet, is about one fifth more than that of magnesia. The zircon employed is an oxide of zirconium; it is found principally near Miask, at the foot of the Ural Mountains. M. Caron economizes the zircon by mounting a point of it on a small stick of magnesia or fire-clay, the zircon being made to adhere by compression and afterwards by baking.

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Block House	$1 75	$0 75
Gowrie	1 75	0 75
Lingan	1 75	0 75
Sydney	2 13¾	0 71¼
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Little Glace Bay	1 75	1 00
Caledonia	1 60	0 75

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	Coarse. Currency.	Slack.
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Any one or more of the books of each department might be used in the infancy of a work, without adopting the whole; or incorporated into a work already in operation.

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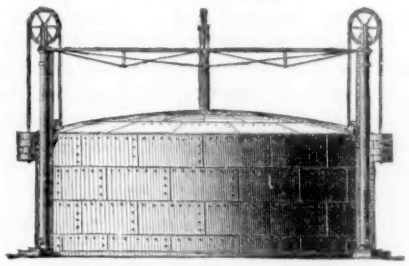

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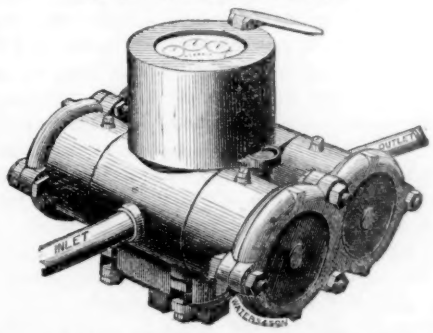

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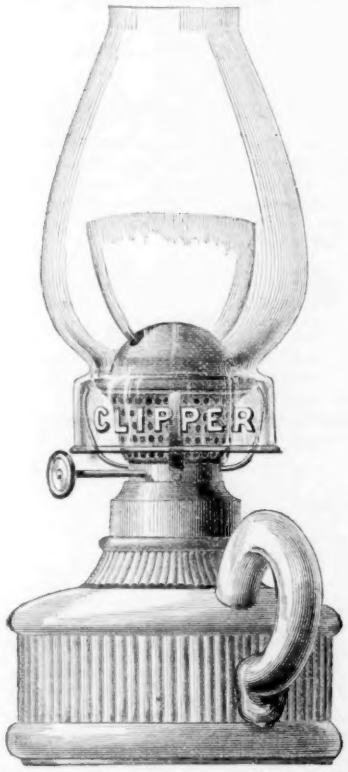

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Published on the 2d and 16th of Each Month

At No. 22 Pine Street, New York.

M. L. CALLENDER & CO.,

EDITORS AND PROPRIETORS.

WEDNESDAY, SEPTEMBER 2, 1868.

WISHING TO MAKE this Journal an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of those subjects a pleasure, or a profession.

Subscribers would confer a favor upon us by remitting *CHECKS* or *POST OFFICE MONEY ORDERS*, as we are frequent losers where money is enclosed in letters.

☞ NEWS AGENCY.—The American News Company, 119 and 121 Nassau street, New York, are agents for this Journal. Newsdealers will please send orders to them.

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Answers to Correspondents.

READER, OF ELMIRA.—The Bloomington (Ill.) Gas Light Company charged, previous to the reduction of $1, mentioned in our last, $5 per 1000 cubic feet.

C. W. S., of OMAHA.—"Fodell's System of Book-keeping for Gas Light Companies" will be published as soon as a sufficient number of subscribers have been received at the office of the Journal. There is no work of a similar nature in existence, to our knowledge. Price, $3.00. See advertisement elsewhere.

N. P., OF SALEM.—You can obtain all the information you desire on the subject you mention, by writing to the editor of the *American Agriculturist*, published in New York City.

E. N., of EAST NEW YORK.—The "Resources of California," a handsomely bound book of 464 pages, was published by W. J. Middleton, New York City, from whom you can probably obtain a copy. It was written by John S. Hittel.

W. O. H., of CHESTER.—Rock-oil naphtha is not adapted for making varnish, as it is a very poor solvent for gums. Coal-tar naphtha is an excellent solvent for gum shellac. This would answer your purpose if you could obtain it It has been sold somewhat at the present price of alcohol.

C. A. C., OF CT.—Fusible safety-plugs are not used in this country for steam boilers. They have been found inoperative. They are still employed to some extent in England, but they are regarded with suspicion, we are told.

S. M., OF PA.—Water is a poor conductor of heat, and you may heat that in one part of a vessel higher than the other portion, but if you stir it so as to keep it mixed, you will find that no fire however hot will heat water above 32° as long as there is a lump of ice in the water. The heat is absorbed and made latent in melting the ice.

IMPROVEMENT IN GAS MANUFACTURE.

McKENZIE'S PATENT PROCESS.

The value of petroleum as a gas-producing material, both as regards quantity and high illuminating power, has been long known, and numerous attempts have been made to render it practicable on a scale commensurate with its importance. Until a recent date, however, none of these efforts have been attended with any degree of success. The merit of adapting petroleum to the production of gas by a very simple and practical method, and one which can be adopted by any Company without alteration in their retorts and their present mode of operation, belongs to a Scotchman, Mr. George McKenzie, of Glasgow. His process, as we have remarked, is very simple, and may be described in a few words. A small proportion of the coal is pulverized by being passed through rollers, and mixed, under pressure, with a certain quantity of crude oil, until the consistency of paste is obtained. This mixture, which can be readily handled without loss of oil, is then added to the coal in such proportions as may be necessary to produce the required degree of illuminating power. When the coal is treated by this process it is clean, and apparently as dry as it was in its natural state, and it can be transported to any distance without loss by evaporation. The importance of this invention will be readily appreciated, for by means of its adoption coals that yield gas of a low illuminating power, and which are not at present used in the production of gas, can be made in all respects equal to the best Cannel coal.

The Alliance and Consumers' Gas Company, of Dublin, Ireland, after several months of careful investigation and experiment, have become so satisfied with the superiority as well as the economy of the method just described, that they have finally adopted it, and the great and populous Irish metropolis is now entirely lighted by the McKenzie process. An agent of the patentee, Mr. John Reid, of Glasgow, has recently arrived in this country, with the view of introducing his friend's invention in the United States and Canada. A series of experiments have been made by Mr. Jos. A Sabbaton, Engineer of the Manhattan Gas-Light Company, of New York, who has come to a highly favorable opinion of the process, as may be seen by reference to his report herewith appended. To what he has so fully and clearly said on this interesting subject, we may add that the petroleum used under Mr. McKenzie's plan, besides raising the illuminating power of the gas produced from the coal with which it is mixed, gives a very considerable increase to the quantity, and in a much larger degree than is obtained separately. Such a result may be accounted for in the following way: A good deal of bituminous vapor and minutely divided carbon, which go to swell the amount of tar, become decomposed by intermixture with the petroleum, and form illuminating gas. In confirmation of this, we may state that in Dublin, where the patent process is followed, the pipes never become choked as they used to be under the old system—a system which compelled the Company to maintain a large body of workmen known as "pipe jumpers," but with whose services they have now been able to dispense. Moreover, the coke derived from the new process is of a better quality than is yielded by the old; while a a considerable saving is effected in the fuel required for heating the retorts.

It has been observed that greater results have been obtained when the poorer coals are used—for instance, coals which yield gas of 12 candle-power can be increased to 18 candle-power.

Nothing, we conceive, can be of greater importance to a large city than the possession of a pure gas, of a highly illuminating power; and we do not go beyond the truth when we say that in this respect there is vast room for improvement in this country. We commend the McKenzie process to the notice of Gas Companies, as it will be found in practice that this method will prove to be far superior for the purpose of utilizing coal oils to any of the methods heretofore brought to notice.

We have only further to add that Mr. McKenzie's process has been patented in Europe, the United States and Canada. His agent, Mr. John Reid, is residing at the Everett House, in this city, and communications may be addressed to him there, or to Messrs. Herring & Floyd, No. 742 Greenwich street, New York.

[MR. SABRATON'S REPORT.]

Manhattan Gas-Light Company,
Engineer's Office, 18th St. Station, N. Y.,
New York, August 5th, 1868.

Dear Sir: I have examined Mr. McKenzie's method of using petroleum and coal oils in connection with coking coals for the purpose of making illuminating gas, and herewith you will find the results obtained.

Mr. McKenzie's manner of treating coal in practical working is to pass it through rollers until it is reduced to a fine powder, and at the same time adding the desired quantity of oil; this mixture (which can be readily handled without loss of the oil) is then added to the coal selected for carbonizing in such proportion as may be required.

In the experiments made by me, not having proper machinery for mixing the materials, the coal was reduced to powder in an ordinary mortar, and the oil mixed with it as well as could be done by using a trowel for the purpose.

The coal used was from Westmoreland County, Penn. The petroleum was from Oil Creek, in the same State, its specific gravity was ·789 (water 1000). The illuminating power of the gas was determined by burning five cubic feet in an Argand burner having 15 holes and a seven-inch chimney, and compared with the light given by a sperm candle, consuming 120 grains per hour.

The retort was first charged with 200 pounds of coal. In three hours and thirty minutes 850 cubic feet of gas was produced, being at the rate of 9,520 cubic feet to the ton of coal. The illuminating power of the gas was 16·81 candles.

The next charge consisted of 40 pounds powdered coal mixed according to the McKenzie method with 10 pounds oil and 150 pounds coal, making the total weight of the charge the same as the preceding one, viz., 200 pounds.

This charge produced 850 cubic feet of gas in three hours and twenty minutes, the candle power of the gas being 20.29, showing a gain of 3.48 candles.

In order to determine whether like results could be obtained by merely adding the oil to the charge by throwing it over the coal as it lay on the retort house floor, the retort was charged with 190 pounds coal, and 10 pounds oil added in the manner stated. The result showed, however, no difference in the illuminating power, and only a slight loss in the yield.

In working on a large scale, however, I am of the opinion that the plan of throwing the oil on the coal in the manner stated above would not prove satisfactory, for the reason that the coal (especially the larger lumps) does not absorb the oil very rapidly; consequently there would be much waste, and the oil would adhere to the shovel or scoops to such an extent that the the work of charging the retort would be rendered very difficult by reason of the sudden ignition of the oil.

When the coal is treated by the McKenzie process, the charge is clean, and apparently as dry as the coal which has not been thus dealt with.

Applied to coal that will yield a gas of a low illuminating power, and to "slack" coals, which are rarely shipped from the mines for gas purposes, I consider the McKenzie method valuable, and well adapted to the application of petroleum for generating of illuminating gas.

Yours respectfully,
(Signed Jos. A. SABBATON, Engineer.

To Mr. JOHN REID,
Everett House, New York.

CROTON AQUEDUCT DEPARTMENT.

The attention of the Croton Board was called some time ago to the great waste of water in New York City, and to which we alluded; they had the subject under consideration during several sessions, and after an examination of the uses to which water is applied in this city, the Croton Aqueduct Commissioners have estimated that there are thirty-five millions of gallons wasted daily. Many propositions were made to the Board—any or all of which might possibly result in checking this reckless waste—but they were nearly all of too expensive a character to justify their adoption. One suggestion (made in THE AMERICAN GAS LIGHT JOURNAL of August 3, 1868), was to have every householder or consumer of water supplied with meters similar to those used by the patrons of the gas companies; but it was estimated that this would require an expenditure of $4,500,000, and the experiment, which would have been effective, was not tried. The Board, however, resolved to make a practical effort to prevent the further waste of water, and they accordingly had notices, of which the following is a copy, served on every householder in this city:

"CROTON AQUEDUCT DEPARTMENT, NEW YORK.

"TO THE CONSUMERS OF WATER:—In consequence of the persistent, wasteful and extravagant use of water, and the reduction in the head of water caused thereby, the Croton Aqueduct Board deem it necessary to call the attention of all owners and occupants of buildings in which Croton water is used, to the existing ordinances and rules and regulations of this Department relative to the supply and use of water; and they announce their rigid determination to enforce their observance by the imposition, in all cases, of the specific penalties for their violation.

"Signed, Thomas Stephens, Robert Darragh, and George S. Greene."

This was doubtless the most judicious course the Board could pursue under the circumstances. It is gratifying to know that the Board is fully alive to the enormous waste of this precious health-giving element, and that they have taken the necessary measures for its prevention. But despite the waste adverted to, the future supplies will be equal to all the possible demands of the population of this city. With remarkable forethought, and a disposition to accomodate the millions who will reside on Manhattan Island, a plateau of water, twenty miles in length, has been secured for New York. It is capable of furnishing 336,000,000 gallons, and a portion of it is now used to add to the supply in the reservoir which is generally short in the dry season. The ground purchased to store this supply embraces about 300 acres, and is located near Boyd's Corner. It is about eight miles north of Lake Mahopac, and eleven miles east of West Point. We learn that workmen are engaged in building a stone dam to concentrate this new supply, and it will soon be completed. When these new water-facilities are in use, the supply will be sufficient for ten millions of people in this city.

THE FRANCO-AMERICAN CABLE.

The subject which at the present time is attracting universal attention is the projected submarine telegraph cable between this country and France; and for the enlightenment of our readers we have gleaned from a daily cotemporary a few facts bearing directly on the subject, which will be read with interest. It appears that a concession has been obtained from the French Government by MM. D'Erlanger and Reuter to lay and work submarine telegraphs between France and the United States, the French Government binding itself not to grant any other concession for lines between France and North America during the period of 20 years from the 1st of September 1869. In consequence a company has been formed, having its principal seat in England, and containing several Englishmen on the direction, for the purpose of constructing and working an Atlantic cable, similar to those at present in use. The new cable will be somewhat more powerful than those now existing, inasmuch as the weight of copper in the conductor has been increased from 300 lbs. to 400 lbs. per knot.

The course of the cable will be from Brest to the French island of St. Pierre, off Newfoundland, and thence either to New York itself, or to some place between Boston and New York, whence the line could be continued to the latter city. Thus the line would consist of two cables, the first section, from Brest to St. Pierre, 2,325, and the second section, that from St. Pierre to the United States, being 722 miles. About 2,600 miles of cable will probably be required to admit of the first section being laid with sufficient "slack," and to allow for all emergencies about 2,800 miles will be shipped. It is not improbable that Plymouth, Mass., will be selected as the landing-place; if so, the direct distance over which the second cable will be laid will be 715 miles. The cable, according to the contract, will be shipped in June next, and the line is expected to be open for traffic in the course of next year. It is said that the Great Easteen will be employed in laying the sea portion.

THE NEW GAS PROCESS.

In the examination of the McKenzie Process for making gas, previously mentioned, taken in connection with the report of Mr. Joseph A. Sabbaton, it will be observed the candle-power in much enhanced in proportion to the amount of oil, etc., incorporated with the coal; and it is plain if a sufficient diluant gas could be introduced on the principle of the Gwynne-Harris or Hydrogen Process, there would be a far greater gain obtained, especially in volume, and also in the aggregate candle-power.

This fact will be more apparent by referring to a former article in this Journal, entitled "Coal Gas and Hydrogen Gas," No. 22, Vol. IX, where the results obtained in experiments made in England with rich coals exhibited wonderful gain in volume, with a fair gain in candle-power as well.

In fact, experiments will soon be made in this direction, and we shall look forward to the results with much interest, and will give due reports of the the same for the benefit of our numerous interested readers.

EDITORIAL ITEMS.

GAS EXPLOSION AT SOUTHBRIDGE, MASS.—A very serious explosion of gas occurred at Southbridge on Saturday, Aug. 23d, and Martin White, who had charge of the works, was hurled a distance of forty feet; he was the only person instantly killed. Two of the injured men, named James Brogan and John Brown, have since died. The explosion was caused by the careless use of a lantern in the hands of Mr. White, who lowered it into the reservoir, which was being cleaned out, thinking that the old gas was all out. It exploded, blowing the building and the great iron tank over fifty feet into the air. All the persons in the building were bruised. The Southbridge Gas Works were newly erected.

AMERICAN INSTITUTE FAIR.—We regret to learn that the American Institute has not yet been able to procure a proper place in which to hold their annual fair, and in all probability we shall have no exhibition of arts, manufactures, etc, in New York this year. This is to be regretted, as the fair of last year, and, indeed, of every previous year, were decided successes.

TAXES ON SMALL GAS WORKS.—Our readers will find a letter elsewhere referring to the unjust action of Congress in removing the tax on petroleum, and ignoring the small Gas Companies, who are suffering under the burden of a heavy taxation, and asking the co-operation of those interested, in an immediate effort to secure the removal of the same. The plan proposed by our correspondent appears to us to be a feasible one, and we would request all interested parties to communicate with us, and tender their aid in accomplishing this most desirable object.

CORRECTION.—In the first page of the last issue of the Journal, in the article descriptive of that excellent invention "Defiance Low Water Alarm," we inadvertently gave the name of T. W. Cowelin as agent. It should have have been T. W. Cowdin.

CONVENTION OF GAS-ENGINEERS.

Most of our late correspondents on this subject have expressed a desire that the Convention be held either in New York or Philadelphia. We believe the majority so far are for New York, and some time this Fall is generally mentioned as the best time. Let all who have an interest in this matter hurry up and advise us of their wishes.

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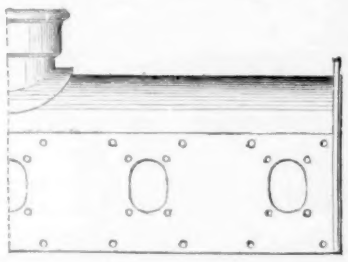

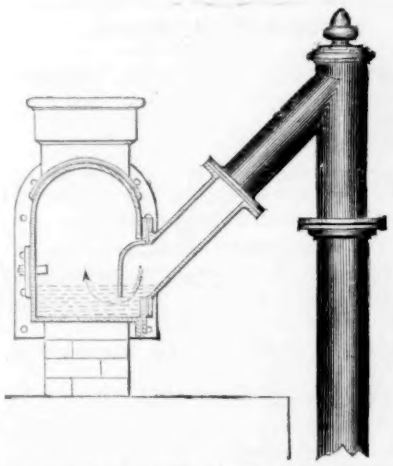

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REFERS TO—J. A. Sabattan, Esq., Engineer Manhattan Gas Co—Col. A J. White, Metropolitan Gas Co.—C. C. Mowten, Engineer New-York Gas-light Co.—J. Mowten Saunders, Engineer Baltimore Gas Co.—John T. Harrison, Engineer Savannah Gas Co.

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EXTRACTS FROM TESTIMONIALS.

These pipes can be laid with much greater facility than the common joint, are tighter when laid, and more secure against any disturbance of the joint by action of time or other causes.

In my judgement, the Robbins Joint is superior to any mode yet presented for connecting gas mains. H. J. MILLER, Cincinnati Gas Company.

After using it extensively, and testing it thoroughly, I am fully persuaded that, as a connection for street mains, the "Robbins Joint" has no equal.

Its superiority consists of facility in laying, economy in time and lead, and, above all, its perfection as a Joint, thus saving largely in leakage. H. STACEY, Superintendent Indianapolis Gas Co.

We are entirely satisfied with the "Robbins' Patent Joint" for connecting our street mains. R. SALTER, Superintendent, Covington Gas Company.

All the pipe laid have been tested by hydraulic pressure, and carefully put down, mostly, with the Robbins Patent Joint.

Experiment has fully demonstrated that said joint is entirely reliable, infinitely superior, and more economical than any other we have seen.—Annual Report of Sup't Cincinnati Water Works.

The experiment of laying the first lot of patent pipe has been concluded to my satisfaction. Your pipe layer laid 1200 feet in ten hours, notwithstanding numerous obstructions, such as rain, mud and water in the trenches, curves and crossings at intersections. E. W. BAILEY, Sup't Evansville Gas Company.

The quantity of Gas saved by using Robbins' Joint for street mains is of the utmost importance to gas companies.
R. T. COVERDALE, Gas Engineer.

As there is always a large difference between the quantity of gas made at the works, and the quantity for which the Company receives pay, any improvement that will reduce that loss must be very important to owners of Gas Works. We claim this desideratum for the "ROBBINS' JOINT."

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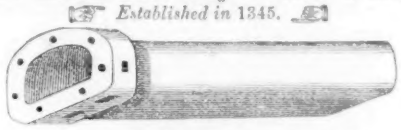

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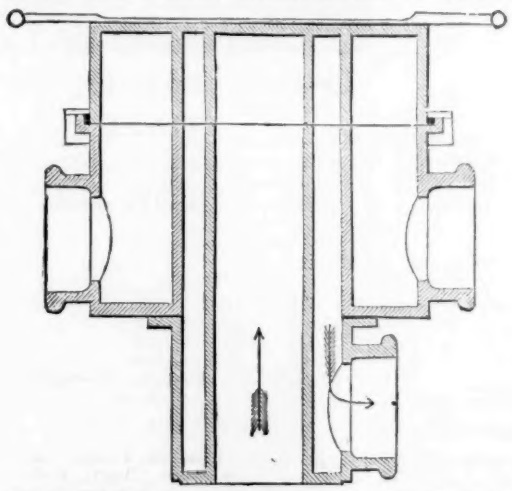

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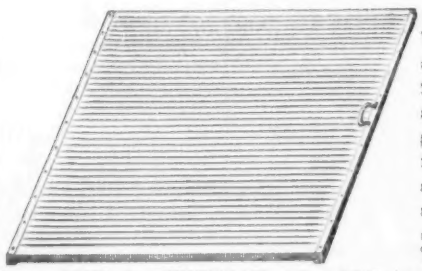

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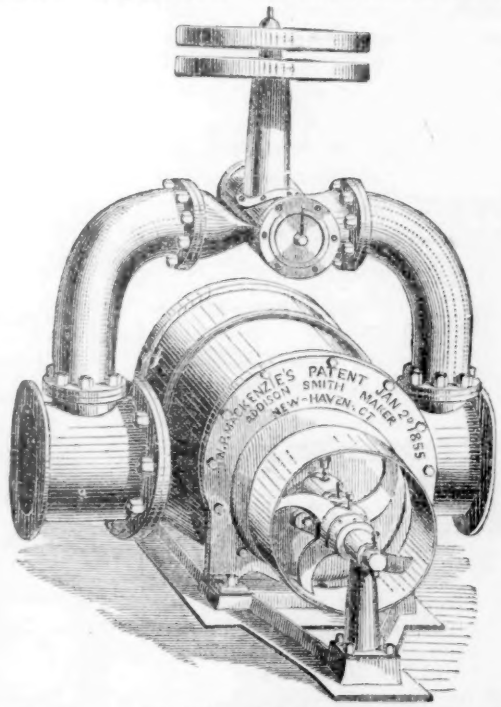

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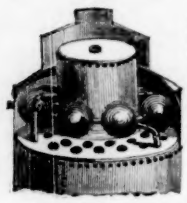

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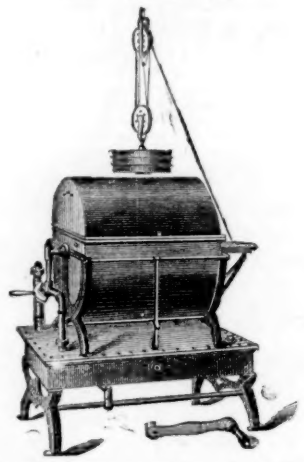

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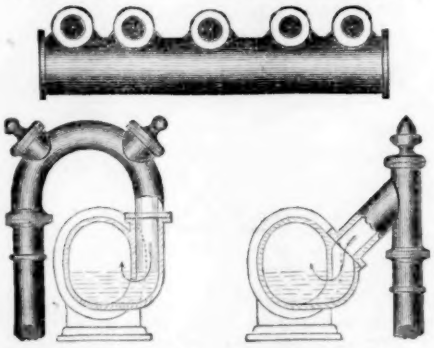

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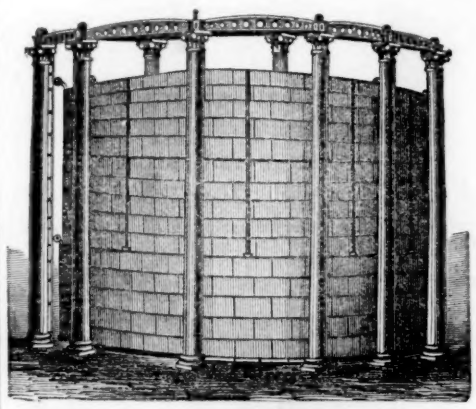

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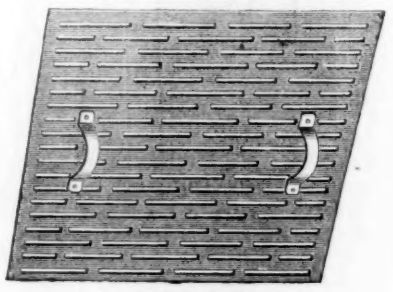

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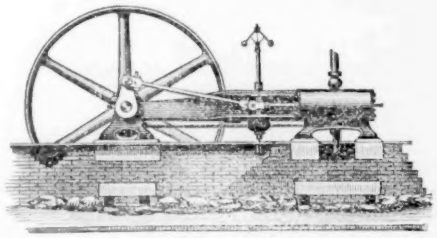

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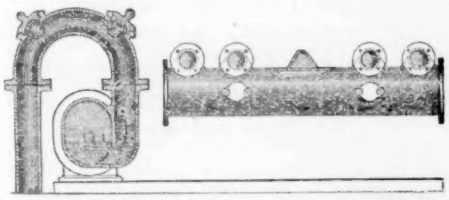

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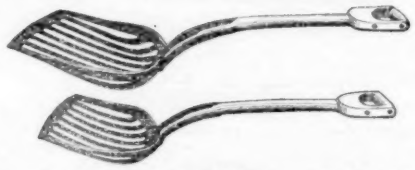

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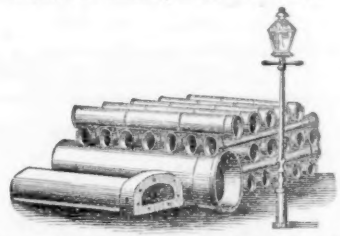

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TUBES,

For Steam, Water, or Gas.

MANUFACTORY AND OFFICE,

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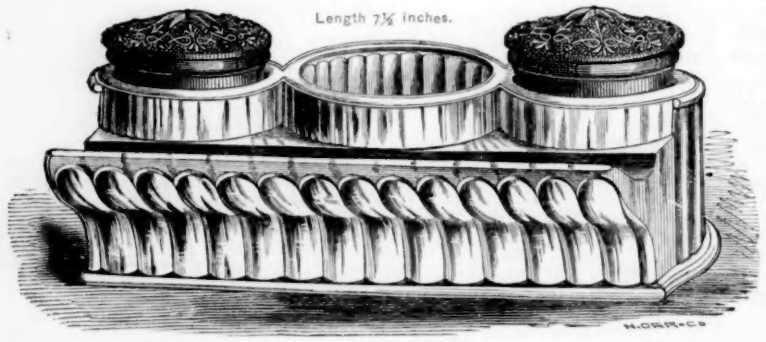
ALSO

58 John Street New York. 171

Improved Combination Inkstand.

The engraving given herewith represents a new description of inkstand, which is made of flint-glass, with handsome bronze caps to the ink-holders. Those who wield the pen with commercial rapidity, or who are engaged in literary pursuits, will appreciate this combination of two ink-holders, sponge-cup and pen tray, in one piece of solid shining glass. We, as editors, welcome anything that will be instrumental in rendering our sanctum comfortable and elegant; and we hold in high estimation whatever facilitates the production of copy.

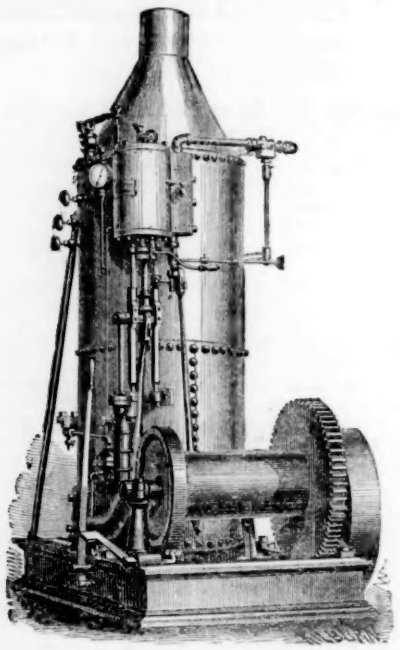


This eminently useful combination inkstand may be procured of Messrs. Hosford & Sons, 57 and 59 William street, New York.

Vertical Hoisting Engine.

This cut represents a vertical hoisting engine; they are also made with a vertical boiler and horizontal engine of all sizes from 5 to 25 horse-power, and a lifting capacity with a single rope of 2,000 to 8,000 lbs.

These engines are extensively used on our docks for loading and discharging vessels; for pile driving and



pumping; elevating brick, mortar and stone, for the erection of buildings, etc., etc.

Every engine and boiler is built of the best material, are fully tested with steam, and are the quickest and easiest working engine in the market.

Hampson & Copeland, 89 Liberty street, N. Y.

—The Commissioners of Patents has extended the patent of M. A. O. Mellier, of Paris, for making straw paper. It is a chemical process for reducing straw and other vegetable matter to pulp by the application of a solution of hydrate of soda, also in the employment of hypochlorites in the process of bleaching. It is said to be a valuable invention.

Improved Boiler-flue Plug.

William M. Sinclair, of Baltimore, Md., has recently patented a very cheap and effective contrivance, we are informed by the *American Artisan*, for stopping leaks which frequently occur around the flue-tubes of steam boilers where they unite with the end sheets; it consists of a hollow cylindrical plug of suitable size to slip into the end of the flue a distance about equal to its diameter, and has a curved flange at its outer end of suitable shape to hold a ring of packing against the end of the leaky flue; on its inside, near its inner end, are one or more pairs of cleats, between which wedges are driven to expand the cylinder in the flue, which is provided for by slitting the cylinder its inner end, about two-thirds of its length, between each pair of cleats, and about in line with the outer ends of these slits are circumferential slots between them which admits of the expansion of the cylinder without bending the flange portion. The plug may be inserted in the flue and the wedges put in place with a pair of tongs, a packing ring having been first placed under the flange, when the wedges should be first driven to tighten it in the flue, and then, by the aid of a crowbar or other convenient tool, the plug may be driven until the leak is stopped, and the wedges again driven to secure it. Every engineer should be supplied with them, as they can be inserted in a few minutes even over a hot fire, and they can be supplied at a fraction over the cost of malleable iron.

—The feed water of boilers acquires a galvanic effect in passing through the tubes of surface condensers.

Advertising Index.

☞ In looking for advertisements, see figures 1 to 9, within brackets, at head of advertisement pages.

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Arnold's Metallic Gas Trays—T. G. Arnold, 334 and 336 West 21st street, N. Y. 6
American Meter Company, 512 West 22d street, New York 8
Automatic Gas Purifier—State Rights for sale—Wm. C. Turnbull, care of T. C. Babcock, 59 Broadway, or office of the American Gas-Light Journal 2
Builder of Gas Works, Apparatus, Etc.—P. P. Delly, 39 Laurel street, Philadelphia 6
Contractors for Gas-works, Etc.—Murray, Baker & Walker, Fort Wayne, Ind. 2
Cambridge Gas Stoves, Ranges, &c.—Gas Light Journal Offices, 3
Gas Coals—Bird, Perkins & Job, 104 Wall street, New York. 4
Gas Engineers and Contractors—Hoy, Kennedy & Co., 111 Liberty street, New York 4
Gas-Burners—C. Gefrorer, 529 Commerce street, Philadelphia, Pa. 9
Gas Meter Manufacturers—Harris & Bro., 1117 Cherry street, Philadelphia, Pa 8
Gas Superintendent—C. M. Cresson, 417 Walnut st., Phil., Pa. 9
Gas Apparatus &c.—Geo. H. Kitchen & Co., 561 Broadway 9
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Gas Burners—W. Anderson, cor Franklin & Elm sts., N. Y. 8
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Gas-works of London—D. Van Nostraud, 192 Broadway. 3
Haskins' Gas Stoves—A. Bliss & Co., 95 Bleecker-st., N. Y. 8
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Columbian Iron Works—Wm. Taylor & Sons, 11, 13 and 15 Adams street, Brooklyn, N. Y. 7
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Babcock & Wilcox's Stationary Steam Engines 8
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Water and Sewerage Pipes—Am. Water and Gas Pipe Company northwest corner of Green and Bay sts., Jersey City, N. J. 5
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Woodward Steam Pump Mf'g Co. 76, 78 Centre st. New York. 9

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J. S. Phillips, Mining Engineer, Wadsworth House, San Francisco, Cal. 4

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Empire Sewing Machine Company, 294 Bowery. 1
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Finkle & Lyon Sewing Machine Company, 581 Broadway 9
Fodel's "Book-keeping for Gas Companies" 3
Gas-Light Journal American and Foreign Patent Agency. 1
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Smedberg's "Synopsis of Gas-Lighting" 6
Situation Wanted as Manager of a Gas Work. 3
Steam Cooking Apparatus—Bennett, Johnson & Co., 42 Dey st., New York 6
Sabbaton's Patent Screening Shovels—A. T. Smithe, No. 126 Maiden Lane, New York city 8
Smith & Sayre Manufacturing Company, 95 Liberty street. 5
Situation as Superintendent Wanted—Sup't Office G. L. Jour. 2
Treatise on the Manufacture of Gas—D. Van Nostrand, 192 Broadway, New York 8
Ventilation—Henry A. Gouge, 251 Broadway 6
Watches—T. B. Bynner 189 Broadway 2
Works on the Manufacture of Gas—D. Van Nostrand, 192 Broadway, New York. 2

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PETROLEUM, WATER-SUPPLY, AND
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☞ M. L. Callender & Co., Patent Solicitors, Office of *The American Gas-Light Journal*, No. 22 Pine Street, New York.

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